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Agency

Solid Waste and
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CLIMATE CHANGE AND WASTE

Reducing Waste Can Make a Difference

CLIMATE CHANGE AND MUNICIPAL SOLID WASTE—TWO ENVIRONMENTAL ISSUES WITH AN IMPORTANT UNDERLYING LINK.

Rising levels of gases in the Earth's atmosphere are causing changes in our climate, and some of these changes can be traced to solid waste. The manufacture, distribution, and use of products—as well as management of the resulting waste—all result in emissions of atmospheric gases that affect the Earth's climate. Waste prevention and recycling are real ways to help control climate change.

WHAT IS THE GREENHOUSE EFFECT?

The atmosphere that surrounds the Earth contains many types of gases, including those known as "greenhouse gases." Greenhouse gases (GHG) absorb and retain heat from the sun. They regulate the Earth's climate by holding warmth in an atmospheric blanket around the planet's surface. Scientists call this phenomenon the "greenhouse effect."

Without greenhouse gases, the average temperature on Earth would be 5 degrees Fahrenheit instead of the current 60 degrees Fahrenheit. Excess greenhouse gases in the atmosphere, however, can raise global temperatures.



1. *The Earth's atmosphere contains greenhouse gases that hold the sun's warmth. In this way, greenhouse gases help control global temperatures.*



2. *Certain human activities release additional greenhouse gases, upsetting the natural atmospheric balance. Increasing the concentration of greenhouse gases raises global temperatures.*

WHAT ARE THE CONSEQUENCES OF CLIMATE CHANGE?

What's so bad about warm days and balmy nights? Why try to reduce greenhouse gas emissions? Unfortunately, increased concentrations of greenhouse gases in the atmosphere will not create a world-wide tropical paradise. Even if it did, the Earth's diverse ecosystems depend on a variety of climates. Human activities that thicken the gaseous "greenhouse" around the planet threaten to disrupt the diversity of habitats and the life dependent on them.

In the past 100 years, scientists have detected an increase of 1 degree Fahrenheit in the Earth's average surface temperature. The international scientific community is increasingly agreed that human activity is responsible for some of this increase. A rise of only a few degrees in the Earth's average temperature could result in:

- More frequent and intense storms
- Flooding of beaches, bay marshes, and other low-lying coastal areas
- More precipitation in some areas and not enough in others
- Wider distribution of certain infectious diseases

Such significant changes could damage communities and national economies as well as alter the natural world. Of

course, many uncertainties remain. No one can predict the precise timing, magnitude, and regional patterns of climate change. Nor can anyone foretell the ability of mankind and nature to adapt to such changes.

It is clear, however, that climate change will not be easily reversed. Because greenhouse gases remain in the atmosphere a long time, turning back climate change may take decades or even centuries.

Just as a heavy coat holds in your body heat on a winter day, greenhouse gases retain the Earth's heat. Imagine, though, if you couldn't take off your parka in August.

WHAT IS THE LINK BETWEEN SOLID WASTE AND CLIMATE CHANGE?

Waste prevention and recycling—jointly referred to as waste reduction—help us better manage the solid waste we generate. But preventing waste and recycling also are potent strategies for reducing greenhouse gases. Together, waste prevention and recycling:

- **Reduce emissions from energy consumption.** Recycling saves energy. Manufacturing goods from recycled materials typically requires less energy than producing goods from virgin materials. Waste prevention is even more effective. When people reuse things or when products are made with less material, less energy is needed to extract, transport, and process raw materials and to manufacture products. The payoff? When energy demand decreases, fewer fossil fuels are burned and less carbon dioxide is emitted to the atmosphere.
- **Reduce emissions from incinerators.** Recycling and waste prevention allow some materials to be diverted from incinerators and thus reduce greenhouse gas emissions from the combustion of waste.
- **Reduce methane emissions from landfills.** Waste prevention and recycling (including composting) divert organic wastes from landfills, reducing the methane released when these materials decompose.
- **Increase storage of carbon in trees.** Trees absorb carbon dioxide from the atmosphere and store it in wood, in a process called "carbon sequestration." Waste prevention and recycling of paper products allow more trees to remain standing in the forest, where they can continue to remove carbon dioxide from the atmosphere.

What Are Greenhouse Gases?

Some greenhouse gases occur naturally in the atmosphere, while others result from human activities.

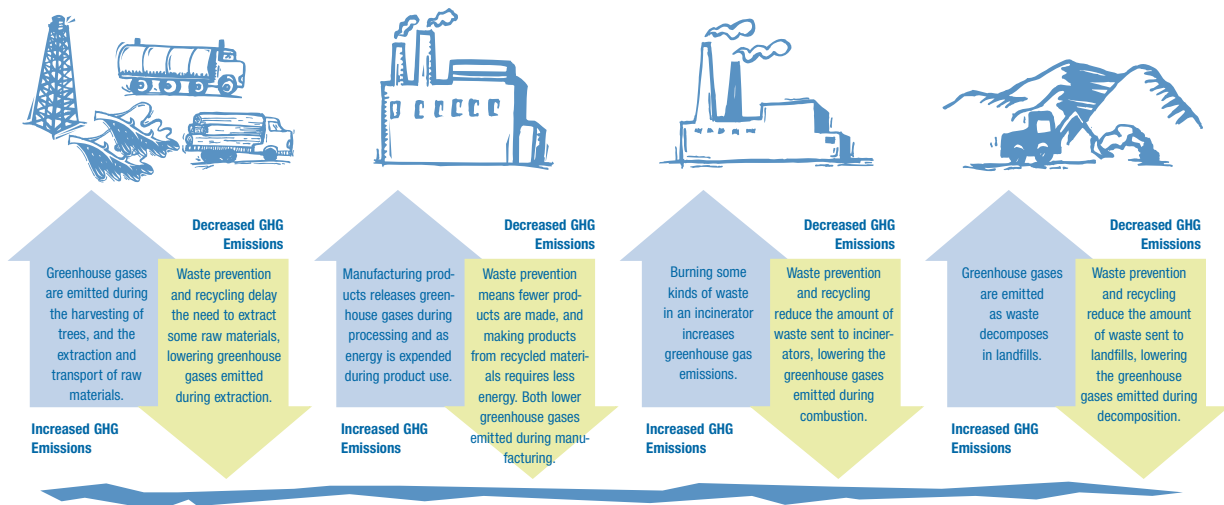
Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain human activities, how-

ever, add to the levels of most of these naturally occurring gases.

Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned.

Methane is emitted during the production and transport of coal, natural gas, and oil; the decomposition of organic wastes in municipal solid waste landfills; and the raising of livestock.

The Link Between Waste Management and Greenhouse Gases



THE BALANCE SHEET: MEASURING THE CLIMATE CHANGE BENEFITS OF WASTE REDUCTION

To help measure the climate change benefits of waste reduction, EPA conducted a comprehensive study of greenhouse gas emissions and waste management. The study estimated the greenhouse gas emissions associated with managing 10 types of waste materials: office paper, newspaper, corrugated cardboard, aluminum, steel, plastic (HDPE, LDPE, and PET), food scraps, and yard trimmings. Management options analyzed in the study included waste prevention, recycling, composting, incineration, and landfilling.

The research indicates that, in terms of climate benefits, waste prevention is generally the best management option. Recycling is the next best approach. The research enables waste managers to analyze their potential to reduce GHG emissions based on the characteristics of their community's waste stream and the management options available to them.

Waste prevention can make an important difference in reducing emissions. By cutting the amount of waste we generate back to 1990 levels, we could reduce greenhouse gas emissions by 11.6 million metric tons of carbon equivalent (MTCE), the basic unit of measure for greenhouse gases. EPA estimates that increasing our national recycling rate from its current level of 28 percent to 35 percent would reduce greenhouse gas emissions by another 9.8 million, compared to landfilling the same material.

Together, these levels of waste prevention and recycling would slash emissions by more than 21.4 million MTCE—an amount equal to the average annual emissions from the electricity consumption of roughly 11 million households.

Every little bit helps! For example, by recycling all of its paper, plastic, and corrugated waste generated in one year, an office building of 7,000 workers could reduce greenhouse gas emissions by 1200 MTCE. This is equivalent to taking about 900 cars off the road that year. If just one household generated 5 percent less waste including newspapers, aluminum and steel cans, and plastic containers and then recycled what remained, 309 pounds of carbon equivalent could be reduced.

HOW ARE EPA'S WASTE REDUCTION PROGRAMS HELPING REDUCE THE EFFECTS OF CLIMATE CHANGE?

The United States is committed to reducing greenhouse gas emissions. In 1992, the United States joined 160 other countries as a signatory to the United Nations (UN) Framework Convention on Climate Change, which calls on countries to reduce their greenhouse gas emissions. Since 1994, the United States has been implementing the Climate Change Action Plan (CCAP), a blueprint for achieving voluntary reductions in greenhouse gas emissions from all sectors of our economy. The CCAP contains some 50 separate initiatives, including one that aims to reduce greenhouse gas emissions through waste reduction and recycling.

Nitrous oxide is emitted during agricultural and industrial activities, as well as during the combustion of solid waste and fossil fuels.

Greenhouse gases that are not naturally occurring include byproducts of foam production, refrigeration, and air-

conditioning that are called **chlorofluorocarbons** (CFCs), as well as **hydrofluorocarbons** (HFCs) and **perfluorocarbons** (PFCs) generated by industrial processes.

Each greenhouse gas differs in its ability to trap heat in the atmosphere.

HFCs and PFCs are the most heat absorbent. Methane traps over 21 times more heat than carbon dioxide, and nitrous oxide absorbs 310 times more than carbon dioxide.

In 1997 in Kyoto, Japan, the Parties to the UN Framework Convention on Climate Change agreed to a historic protocol on climate change. The “Kyoto Protocol” sets binding targets and timetables for emissions reductions and encourages the use of market-based measures to meet those targets. The specific limits vary from country to country but are similar for Europe, Japan, and the United States. The U.S. target is 7 percent below 1990 emissions over a 5-year period spanning 2008 to 2012. A follow-up meeting of the Parties in Buenos Aires in 1998 focused on setting deadlines and developing a workplan for meeting the targets. On November 12, 1998, the United States signed the protocol, but ratification will require the advice and consent of the Senate. In addition, Congress has mandated that the U.S. Global Change Research Program assess the potential consequences of climate change on the nation. The national assessment began in 1997, and the initial Synthesis Report of the findings is expected to be published in 2000.

Waste prevention and recycling can make a significant contribution to reducing our nation’s greenhouse gas emissions. At least 5 percent of the total reductions called for in the CCAP are expected from waste reduction and recycling. To help achieve these reductions, EPA supports a number of programs, including:

- **WasteWise.** WasteWise is a voluntary partnership between EPA and U.S. businesses, state and local governments, and institutions to prevent waste, recycle, and buy and manufacture products made with recycled materials. Presently, more than 900 organizations are participating in the WasteWise program.

- **Pay-As-You-Throw Programs.** EPA provides technical and outreach assistance to encourage communities to implement pay-as-you-throw systems for managing solid waste. Under pay-as-you-throw, residents are charged based on the amount of trash they discard. This creates an incentive for them to generate less trash and recycle more. Currently, there are over 4,000 pay-as-you-throw communities in the U.S. On average, communities with pay-as-you-throw see waste reductions of 14 to 27 percent.

- **Waste Reduction Demonstrations.** EPA has funded more than 30 projects that demonstrate innovative waste reduction approaches with the potential to achieve significant reductions of greenhouse gas emissions.

For More Information

For an online copy of EPA’s report “Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste” (EPA 530-R-98-013) and for additional educational materials on climate change and waste, access <www.epa.gov/mswclimate>. EPA’s Landfill Methane Outreach Program (LMOP) also demonstrates how to put waste to good use. As waste in landfills decomposes, it produces methane gas, which contributes to global warming. LMOP shows companies, utilities, and communities how to capture landfill gas and convert it to energy. Access the LMOP Web site at <www.epa.gov/outreach/lmop/>.



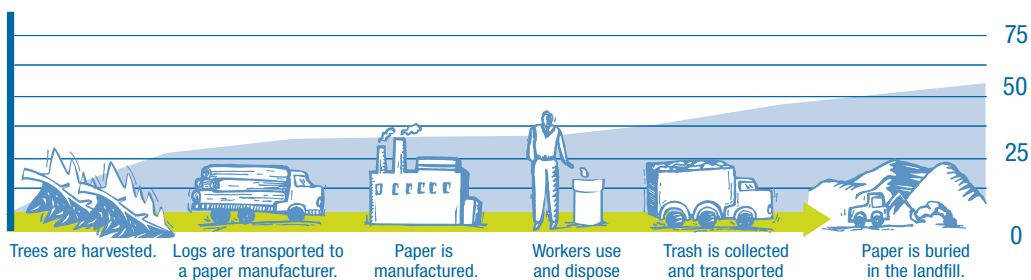
You Can Make a Difference!

By choosing to prevent waste and recycle, you can help curb climate change. Assume your office, for example, throws away 100 tons of white office paper each year. If you recycle just half that amount of paper, look what happens:

Scenario 1

Throwing away 100 tons of paper

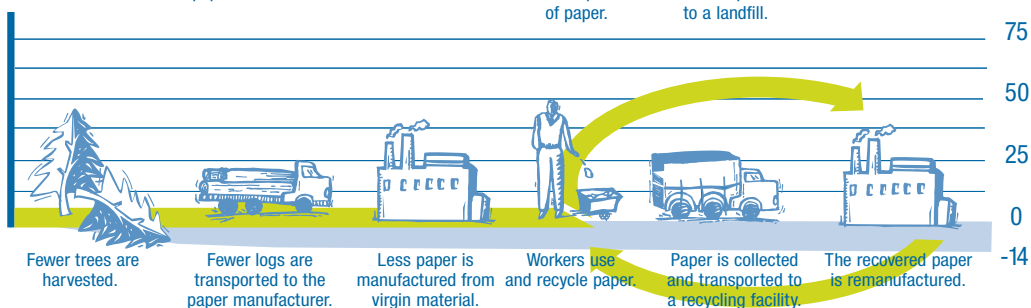
Result:
53 MTCE



Scenario 2

Recycling 50 tons of that paper

Result:
-14 MTCE



Greenhouse Gases Released (Measured in MTCE)



Find these materials online at:
www.epa.gov/mswclimate

"GREENHOUSE GASES ARE ESSENTIALLY A SUSTAINABILITY ISSUE. AND IF WE WANT TO MOVE TOWARD BEING SUSTAINABLE, WHICH MEANS NOT PASSING OUR COSTS ONTO FUTURE GENERATIONS, WE MUST INCLUDE WASTE REDUCTION AND RECYCLING."

ZACK HANSEN
ENVIRONMENTAL HEALTH SECTION MANAGER
ST. PAUL-RAMSEY COUNTY DEPARTMENT OF PUBLIC HEALTH (MN)

"SOURCE REDUCTION AND RECYCLING HAVE BEEN LONG ACKNOWLEDGED FOR THEIR RESOURCE CONSERVING EFFECTS. NOW THAT WE CAN DEMONSTRATE THEIR LINK TO CLIMATE CHANGE AND THE REDUCTION OF GREENHOUSE GAS EMISSIONS, WE HAVE BROADENED THE SCOPE OF LONG TERM BENEFITS THAT COME FROM WISE MATERIALS MANAGEMENT."

WILLIAM M. FERRETTI
EXECUTIVE DIRECTOR
NATIONAL RECYCLING COALITION

"REDUCING GREENHOUSE GAS EMISSIONS IS THE KEY THAT LINKS ALL OUR STRATEGIC PLAN ENVIRONMENTAL GOALS TOGETHER. WE WILL GET THESE REDUCTIONS BY ENCOURAGING NO-REGRETS OPTIONS WITH NEW TECHNOLOGIES, ENERGY EFFICIENCY, RECYCLING, POLLUTION PREVENTION, AND OPEN SPACE PRESERVATION. THESE INITIATIVES WILL HELP US MEET ALL OUR ENVIRONMENTAL IMPROVEMENT GOALS. REDUCING AIR EMISSIONS AND GREENHOUSE GASES IS AS NECESSARY AS PUTTING RECYCLABLES AT THE CURB."

BOB SHINN
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